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REPORT ON NETHERLANDS NEW GUINEA FISHERIES

by

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INTRODUCTION

Following the request made by the Government of Netherlands New Guinea to the Commission, I arranged to break my journey to Nouméa in order to stay in that territory from July 6 to July 21, 1954. The Territorial Administration requested me to make an investigation of the Fisheries work done so far by the Fisheries Section of the Department of Agriculture and Fisheries and to give opinions on this work

I was especially requested to examine closely the trawl fishing experiments undertaken with the research vessel, "De Goede Hoop" as well as any research considered as justifiable for the near future.

However, a fortnight is a short time in which to investigate such a large territory, and consequently I was only able to survey personally four points on the north coast, namely the surroundings of Hollandia, Biak, Sorong and Waigeo. Estuaries and coral reefs were investigated from the air. Information was gathered through discussions with authorities and fishermen as well as from three reports:

1. D.C. Zwollo, The Sea and Rivermouth Fisheries in the Merauke Area, Nov., 1953.
2. Annual Report of the Fisheries Section, 1953.
3. G. J. Bottemanne, Sea Fishery, 1953.

I also intended to go to Merauke but this trip was prevented by the cancellation of the flight. The Governor, Dr. J. van Baal has proposed that I should return in January, 1955. (see Summary of Recommendations - No. 14)

I have omitted geographic and scientific details from this report since, as far as they are known, they have already been mentioned in the works of other writers. By agreement with the Governor of the Territory I have only given technical advice likely to produce immediate benefit.

The utmost assistance and co-operation was given by all those contacted in the territory.

THE LOCAL POPULATION'S FISHING METHODS AND SKILLS

The coastal population uses very simple fishing methods; handline, troll-line, sero, cast-net, drag-seine, shrimp-seine, shrimp push-net, set-net, scoop-net and spear. This equipment will appear simple, at least from a European point of view, but it can be said that these people have used exactly the fishing gear which they could handle and which they could afford under the circumstances.

With some of this gear they use ordinary canoes or canoes fitted with outriggers. Some of the equipment must be taken into consideration in the development of fisheries: hand-line, troll-line, sero*, drag-seine and set-net. The shrimp-seine should perhaps also go into this category but I lack detailed information on this type of gear as existing and used in this area.

Professional fishermen are few - most people are both farmers and fishermen and many fish for their own consumption only. Many, (including women and children) also collect shell food. My general impressions are as follows:

1. Some of the local inhabitants are able to mend nets.
2. Most of the coastal people can handle a canoe, some a sailing canoe even in a breeze.
3. They are skilled in spotting and catching fish.
4. They can endure hardship.

In other words, they are fish minded.

Among the disadvantages, I would mention that most of them are illiterate and, for the time being, will have to live according to their tribal customs. I observed, however, that natives trained by the Fisheries Section were a very valuable asset for developed fisheries work.

* A type of permanent fish trap.

THE WORK OF THE FISHERIES SECTION - DEPARTMENT OF AGRICULTURE AND FISHERIES

The main office, under the direction of the Head of Fisheries, Mr. D.C. Zwollo, is situated in Hollandia. The Fisheries Section has stations in Hollandia and Manokwari and a temporary station in Doom Island (Sorong).

Hollandia Station:

At the moment, the activities of this station are:

1. General Control.
2. Storage of fishing gear for the section's research work and for sale to private fishermen.
3. Extension service.
4. Research on troll-line and beach-seine fishing.
5. Training fishermen in the use of motorised fishing craft.

This station has two small open motor launches, each equipped with a 20 B.H.P. Samova diesel engine.

Manokwari:

The activities of this station are:

1. Research on long line fishing for tuna, etc.
2. Research on bait fishing.
3. Research on troll-line
4. Training fishermen in the use of motorised fishing craft.

This station has an 82ft. research vessel powered by a 200 B.H.P. Kromhout diesel engine. The name of the vessel is "Hollandia", the equipment on the vessel also includes cold-storage. The station also has one small open motor launch equipped with a 20 B.H.P. Samova diesel engine.

Doom Island:

The first main fisheries station for Netherlands New Guinea was established on this island but when headquarters were removed to Hollandia, one person only was left there to service the research vessel, "De Goede Hoop". This vessel is used for the following work:

1. Research on bottom trawling
2. Hydrographic work (reconnoitering sea bed)
3. Research on troll-line

4. Training fishermen in the use of motorised fishing craft.

5. Detection of fish with fish detector.

"De Goede Hoop" is temporarily based on Doom Island, her activities being pursued at the moment near the western part of Netherlands New Guinea. This research vessel is 72ft. long and is powered by 150 B.H.P. Kromhout diesel engine. It is equipped with a cold storage installation, echo-sounder and fish detector (fishloop).

Preliminary investigations had been carried out previously from Poelau Doom, mainly in connection with tuna fishing with poles. This offered no real prospects for that area under existing circumstances. Since 1953 and up till the present, fisheries research has been on a much larger scale. This work has however, been implemented under great difficulties caused by lack of trained personnel and mechanical breakdowns, mainly affecting the research vessel "Hollandia".

The choice of a peculiar type of Kromhout engines for the two research vessels has been unfortunate. If ordinary types of the same make, more commonly found in Netherlands New Guinea, had been selected, the trouble would not have been so great. In any case, these ships have collected a wealth of information from which one can already form an idea of existing possibilities and necessary corrections to be made. It is evident that Mr. Zwollo and his staff have worked hard and they have already a lead over many other countries, some of which are more developed than this territory. It is because they have borne the heaviest burden of the organizational stage under difficult conditions that I am now able to give some advice regarding the continuation of the work.

I would like to make it clear now that any criticism of their work will be made in a constructive spirit with a view to the future. However, such comments as I have already made while in Netherlands New Guinea have been appreciated by all concerned.

In the main, the research so far has taken place along the north coast and off the westernmost coast of Netherlands New Guinea. Long-line fishing trials for tuna with the research vessel "Hollandia" have not yet been carried out completely. Trawling experiments with the research vessel "De Goede Hoop" have to be repeated near the Mamberamo area in the course of one or two trips. Mr. Zwollo has already

investigated Merauke and his report was very useful to me in connection with data collected from a survey carried out before the war near the mouth of the Merauke River.

The research vessel "Hollandia", at present waiting for engine spare parts, will presumably be ready soon to resume operations, so that a final decision regarding future activities of this kind can be taken in January/February, 1955.

As a starting point, my opinion is that the research vessel, "De Goede Hoop" should commence her trawl and trolling in October 1954 along the south coast of Netherlands New Guinea. Until October, this vessel would have the opportunity to finish her task along the north and west coasts. We cannot consider for the time being, the ways and means of selling or preserving the fish. I have personally seen cases where, before one knew exactly if it were possible to catch fish and deliver it to the right place, the building of a fish cannery, fishmeal factory or cold storage plant was undertaken. It appeared afterwards that these installations were wasted, either because there was not enough fish or because they were built in the wrong place. The primary issues at the moment are to catch fish and to decide which species and fishing methods are the most profitable.

In the next section I will deal separately with each station, the work they should undertake and the obvious prospects.

FISHING AREAS, FISHING GEAR, CRAFTS AND FISHHollandia.

The fresh fish supply in Hollandia is absolutely insufficient and one can say at present that the town is in a very unfavourable situation in respect to any fishing grounds which could provide it with an abundant supply of fish. That is, of course, with the fishing gear and boats at present in the hands of local fishermen. I have scouted the waters surrounding Hollandia both with plane and boat. This is mainly deep and clear water and this makes the case difficult since skilled fishermen would be necessary to work such an area. For the time being, deep water is considered only in connection with troll-lines operating from small motor boats of the 10 metres type (see appendix I).

A really good fishing ground is situated before and on both sides of the mouth of the Tami River; in other words, from the Australian New Guinea border to Humboldt Bay. Certain indications have been obtained with baby-seine and baby-trawl. This area should be considered mainly in connection with two methods requiring the use of the 8 metres type of boat (appendix 2).

The first method would use a simple beach-seine 120 metres long (appendix 3) with 120 metres tow-line on each wing. The fisheries station has already a 60 metres beach-seine (which is very small) and I observed good catches made with this baby-seine. In three hauls of 10 minutes each, we caught 20 kilos of Koero (fam. Polynemidae) and Soesoe (fam. Lactaridae) and a sawfish (fam. Pristidae) of 62 kilos. There were also some shrimps in the net. When fishing very near the river mouth, the leadrope of the seine would sometimes stick in the soft bottom but I have taken this into consideration when designing the enlarged 120 metres seine. A seine equipped with a bag would be better but its use requires skilled fishermen. Nevertheless, if it is later on decided to introduce this improvement one merely has to take off a width and a depth of 265 meshes in the middle of the seine and add to it a four sided bag. Every side of the latter must be 265 meshes and tapered down to 65 meshes, every mesh on both sides reduced by half a mesh. The four sides must be seamed together.

The second method would use a nylon bottom gill-net 18 metres

long (appendix 4). In connection with the 8 metres boat it would be necessary to use a battery of 50 such nets (900 metres). 5 nets of this type are lashed together to form one unit and a full battery includes 10 such units. At the junction of the units there is a junction line with a weight (piece of chain or a stone) and a buoy-line going from the weight to the surface where it is attached to a buoy. The nets are set in such a way that the lead rope touches the bottom. It is thus possible to fish in depths up to 20 metres.

The seine would be mainly used for daylight fishing and the bottom gill-net mainly for night fishing although it could also be used in the day time when the water is turbid. A coastal long-line fishery can probably be undertaken later on with the bait which can be expected, among other things, from the seine and bottom gill-net.

It is therefore suggested that the fisheries station should, in the first place, work with the three types of gear previously mentioned for fresh fish, inside a radius of 15 sea miles. Along these lines there is a reasonable possibility of providing a sufficient fish supply for Hollandia in the future, notably among the following species:

With the beach-seine:

Bottom and pelagic fish, like koero (fam. Polynemidae) soesoe (fam. Lactaridae), tjoetjoet gergadji (fam. Pristidae), manjoeng (fam. Ariidae), goelamah (fam. Sciaenidae), kemboeng (fam. Scombridae), lajoer (fam. Trichiuridae), lida (fam. Soleidae), peperek (fam. Leleognathidae), selar (fam. Carangidae), tambang (fam. Clupeidae), etc.

With the bottom gill-net:

Bottom fish like koero, soesoe, manjoeng, goelamah, lida, peperek, etc.

With the troll-lines:

Pelagic fish like yellowfin tuna (Neothunnus macropterus Kish), tengirie (fam. Cybiidae), aloe aloe (fam. Sphyrnaeidae), koewah (fam. Carangidae), soenglir (fam. Carangidae) and different species of tuna.

With the long-line:

Tuna, sharks and swordfish.

8 metre boats (appendix 2) could fish west of Hollandia (down to Sermowai River) and salt their catch. With such boats one can enter the rivers, shallow bays and if necessary, the craft can be run ashore in places where there is no surf. They could return to Hollandia after one week trips.

It appears therefore that a reasonable fish supply could be found in the future and if it were possible to increase the catches in the west, near the Mamberamo area or the Schouten islands, it might even be possible to consider a fish carrier service to Hollandia. The fishing grounds near Hollandia are however available to meet the first needs. It would be advisable for the Government to buy the boats and nets necessary and let these be tried out by a crew paid with a share of the proceeds.

Manokwari.

According to official data collected from foreign sources, large quantities of tuna could be found north of Netherlands New Guinea. The Government was particularly interested in this fish since an export production could be expected if large catches were possible. The tuna research vessel "Hollandia" (data on page 3, Manokwari) was accordingly bought and some training and orientation trips were started in the first half of 1953 in Radja Ampat area and around Geelvink Bay. The "Hollandia" is stationed in Manokwari.

The first fishing experiments were carried out by unskilled fishermen and without a long-line winch. The long-line had a length of 13,000 metres at first and it is easily understandable that it took a lot of time to take it in by hand. The conditions were changed when a long-line winch was received. At this time different lengths of long-line were used. The vessel now has a maximum of 19,800 metres of line.

Regarding the construction of the long-line, please refer to appendix 5 showing a type used in the latter stages. It was mainly made of cotton line, 132 threads, or 156 threads. However, much trouble was experienced with breakage and 240 threads line was ordered afterwards.

From the data made available to me on the 1953 operations, the maximum catch per day was 3.8 tuna and 8.7 shark per 100 hooks. On many days less than one tuna per 100 hooks was caught. Some swordfish have also been caught. Although the fishing was not regular, due to engine and cold storage installation troubles, it can be said that the catches were bad. I very much regretted not being able to meet the Master of the research vessel but Mr. Zwolle gave me all the information he had about these operations. I understand that the bait was not satisfactory. From data made available to me, I observed that the fishing was done

on places indicated as being rich in tuna. The Master of the ship is a man who had already gained experience with the long-line in other areas of the Pacific.

I feel that one or more of the three following factors have been responsible for the poor results:

1. Engine trouble.
2. Unsuitable bait.
3. Lack of fish in the areas investigated.

For the time being the first two factors seem to be the most important. Indeed the third one does not mean there is no tuna since only a small part of the tuna area was fished and these waters were indicated as mentioned above as being rich in tuna. Fortunately, the necessary engine parts will arrive soon and fishing operations can then be started again.

A solution must be found for bait. A group of bait fishermen has already been investigating along the coast for a long time, in Geelvink Bay and around the neighbouring islands. They have at their disposal a motor launch, skiffs and bait nets. The bait catches are however very irregular. Experiments have been made with lamps, beach-seine and lift-net. They sometimes have to seek the fish in far away places and the bait often arrives at the destination in a very bad condition.

I have advised experimentation with lures (appendix 6), of the kind used in the Java Sea and in the Celebes Sea for bait fishing. These are very attractive for Herring and Mackerel of various species which provide excellent bait. If fish is attracted it can be caught with a lift-net or lampara and even, if the lure is anchored near the coast, with a beach-seine.

My personal opinion is that even if bait and tuna can be caught in fair quantities, tuna fishing cannot be carried out in a commercial way on the high seas by local fishermen or Dutchmen for the following reasons:

1. Long-line fishing in the open ocean is a hard job for fishermen and it can only be done by skilled people, none of whom are available in Netherlands New Guinea.
2. Skilled Dutch fishermen earn a good income in Holland

and would have to be paid twice as much in Netherlands New Guinea which means an income equivalent to that of a high Dutch Government official. In other words they are too expensive.

Tuna fishing research is only useful for:

1. Big concerns employing foreign fishermen.
2. A tuna fishery with reduced long-lines operated not far from the coast by small motor ships with a crew of local fishermen. For instance the 10 metre type of boat (appendix 1) with 10 to 15 sets of long-line.

Geelvink Bay:

The "Hollandia" also devoted some trips in the Geelvink Bay area to trolling experiments. Very good catches were made near the reefs of Japen, Mios Noem, Mios Aeri and Ajawi. A maximum of 61 kilogrammes of fish was caught per hour and a minimum of 17 kilogrammes per hour. The catch was composed only of first class fish: yellowfin tuna (Neothunnus macropterus, Kish), blue bonito (Euthynnus alliteratus affinis (Gant)), Hondstand tunny (Grammatorcynus bicarinatus (Q.G.)), kaalkop (Pomatomus saltator (L)), tengiri (Scomberomorus (Cybium) commersoni (Lac)) and Acanthocybium solandri (C.V.), baracuda (Sphyrna barracuda (C.V.)), bobaro or koeweh (fam. Carangidae), soenglir (Elagatis bipinulatus (Q.G.)) and kerapoe lodi (Plectropoma maculatum Bloch).

From all the data available I am convinced that there are excellent possibilities for troll fishing in Geelvink Bay since the same catches can be expected with a small seaworthy boat. The "Hollandia" was fishing with 5 troll-lines and this can also be done with the 10 metres boat (appendix 1), in good weather. Should bad weather build up, the boat can find a safe anchorage behind the islands. If it should be thought that this type is too small, since I have no data after all regarding the winds, the same shape could be used, increasing for instance, the dimensions to 14 metres in length and 4 metres beam with a 30 B.H.P. engine. In any case there are fish, there are line fishermen, and Biak, for instance, offers an outlet for the catch.

I see a possibility in the Biak area for the 8 metres boat (appendix 2) for troll-line and hand line fishing.

The "Hollandia" also fished with hand lines at night, and catches

were very good. For 29 nights the crew was fishing for some hours every night in their spare time and the total catch was 2,547 kilogrammes giving an average of 88 kilogrammes per night for only a few hours' fishing.

On the whole, my opinion is that motor fishing boats, of a type suitable for the use of the natives in connection with trolling and hand-line fishing, should be tried out in the Geelvink Bay area. It would be best to begin in Biak or Manokwari.

Sorong.

Trawling: "De Goede Hoop" is stationed in Sorong (Poelau Doon). Mr. Zwollo asked me to accompany him to this station because the results of trawl fishing experiments with this research vessel were poor. She had for instance, been fishing in the Mamberamo area from which one would expect good trawl catches. The results were nevertheless bad, the average hourly catch being 28.5 kilogrammes of fish. This average is computed over 27 fishing days for a total of 240 hours' trawling. It is remarked that the echogram record gave indications which probably meant fish. The maximum hourly catch was 63.8 kilogrammes and the minimum 14.1 kilogrammes.

After going on board the Master gave me all the data about the trawl net which I found to be correctly built. These dimensions were 61 ft. headrope and 92 ft. groundrope, mesh width from 11 to 6 centimetres. On the 14th July, we started fishing in the Kabosi Bay. This is one of the Bays of Waigeo Island. The first drag was made in 50 minutes. Only 45 fathoms warp were used. We fished from deep to shallow water. When the trawl net was pulled in, it was found that all the fish in it were alive, which meant that they had been caught at the last moment and that the net presumably had not touched bottom at all in the beginning. The catch weighed 325 kilogrammes. For the second drag I asked the master to give more warp length. We fished with 60 fathoms warp and were fishing in 14 to 15 fathoms for 90 minutes. When the net was taken in we had to take over the codend twice. This catch totalled 1,050 kilogrammes of fish. So in 140 minutes we caught 1,375 kilos of fish.

The detector showed fish not only on the bottom but also in the higher layers of water. These were however too high for the trawl-net

and may have been kembungs (Scomber neglectus). There were some specimens of these latter in the net which had probably been driven into it by the false headline, which travels higher than the top of the trawl.

Such an amount of fish had never been caught before in the same time. The indications after fishing were such that I feel quite sure the gear is correct. It would however be better to have slightly smaller and lighter otterboards with strops on the backside (see 6 in appendix 7). This is the reason why I designed the otterboards shown in appendix 7.

Once I had verified the gear was good, I asked Mr. Zwollo to make some trials again in the future in the Mamberamo area where the catches had been unnaturally low. It should be understood that if this area could produce more fish the supply for Hollandia would be greatly improved.

Trolling: On the last trip before my arrival "De Goede Hoop" found a good trollfishing area near the reefs of the Radja Ampat group. Fishing in the day time with 5 troll-lines showed a catch of 2,338 kilogrammes of first class fish in three days. The catch was sold in Sorong for a total of 4,091.50 Guilders.

It is evident from this that a fishing area for trawl-net and troll-lines, which can be fished by smaller motor boats than "De Goede Hoop", is available to supply Sorong. There must also be some possibilities of fishing with bottom gill-nets. (appendix 4).

Merauke.

There are certain indications that good fishing grounds can be found near Merauke. Before the war the Institute of Sea Fisheries carried out a trial with Chinese fishermen from Bagan Si Api Api (Sumatra). Many of the fish species found near Bagan were also found here. Good catches were made with a tidal net. The species caught then are also mentioned in the Merauke report for 1953, written by Mr. D.C. Zwollo. This report also gives good indications and the local people make rather good catches using simple gear.

It is intended to start an investigation with "De Goede Hoop" along the South Coast, the vessel being then stationed in Merauke. The most

important area will be from Frederik Hendrik Island to the Papuan border. I feel sure there must also be some good fishing grounds off the south-west coast of Netherlands New Guinea between Kaimana and Frederik Hendrik Island but this area seems to be too sparsely populated. The south coast should be investigated by "De Goede Hoop" with trawl, troll-lines and hand-lines. It is regrettable that nylon bottom gill nets are not yet available. I have advised Mr. Zwollo to order these in 7, 9 and 11 centimetres mesh widths. I also advised an all round survey of the south coast.

I realise that the Master of a research vessel has a heavy job with the management of the vessel and the research operations and that he has not enough time in which to make records of the research work. It is however, essential to do so and I advise that a qualified person be selected to do it under the supervision of the Master, for instance to collect the following data:

Trawl Fishing: Type of trawl net, length of warps, duration of drag, weather including wind direction and wind speed, temperature and salinity of the sea water near the surface and also near the bottom if possible, data given by echograph (depth and fish indications), indications given by the fish detector (fishloop), direction and speed of currents, moon phase, clearness of the sea water (using a white disc 30 centimetres in diameter), nature of bottom, direction and distance of drag, position of the vessel, fish species caught and estimate of weight, particulars, data, with the whole being signed by the Master.

The same should be done in connection with other types of fishing gear and the necessary data can be deduced from those indicated above. These data should be recorded for every drag with the trawl net or for every trial with other types of gear.

Special attention should be paid to shrimps and prawns as I think they must be found in some places South of Netherlands New Guinea. Any information regarding these crustaceans will come from the trawl-net. If some are found in the trawl-net of "De Goede Hoop", a drag should be made with the shrimp net already available.

The mouth and surroundings of the Merauke River will presumably prove a good fishing ground, suitable for the local people. It will therefore be necessary to have exact data on the speed and direction of currents, fall and rise of the tide, in other words, a full report of the horizontal and vertical motion of the water. I would request special attention to be paid to spring and neap tides. Every fishing method used in this estuary will depend on the tide.

SUMMARY OF RECOMMENDATIONS

1. A beach-seine 120 metres long (appendix 3) should be made and tried in front and on both sides of the Tami River.
2. Nylon bottom gill nets (appendix 4) should be made or ordered and tried along the coast in maximum depths of 20 metres from Hollandia to the Australian New Guinea border.
3. An 8 metre sail boat (appendix 2) should be made or ordered and equipped with an air-cooled diesel auxiliary engine of 4.5 B.H.P. with sideboard shaft and propeller. This boat would be for native fishermen to use near the coast.
4. A 10 metres fishing boat (appendix 1) equipped with a 20 B.H.P. diesel should be made or ordered for all kinds of line fishing with a crew of native fishermen.
5. Some fish lures (appendix 6) should be anchored for bait fishing in the Manokwari area.
6. Two new otter boards (appendix 7) should be made for "De Goede Hoop" in order to ensure easier going over soft bottoms and give a better spread to the trawl net.
7. Trawling experiments should be repeated in the Mamberamo area with "De Goede Hoop" during two trips, using lengths of warps at least three times the depth of the sea.
8. Trawling and trolling South of Sorong, among other places, in the Maccluer Gulf until October.
9. From October on, trawling, trolling and hand-line fishing along the South Coast with "De Goede Hoop" based at Merauke. If shrimps or prawns are found, the shrimp trawl should also be used.
10. An all round survey of the South Coast should be made with the gear mentioned in 9. and records should be kept of it as indicated on page 13 (Merauke).
11. Nylon bottom gill-nets in 7, 9 and 11 centimetres mesh widths should be made or ordered for the south coast.
12. An investigation of the horizontal and vertical motion of the water in the mouth of the Merauke River should be carried out (see page 14).
13. For the time being long-line fishing with the "Hollandia" should be continued and some trials should also be made not far from shore.

This research work might be further discussed in January or February.

14. If it should be possible for me to make a trip along the South Coast with Mr. Zwollo in January or February next and obtain a general view of New Guinea, there should be a consultation to decide :

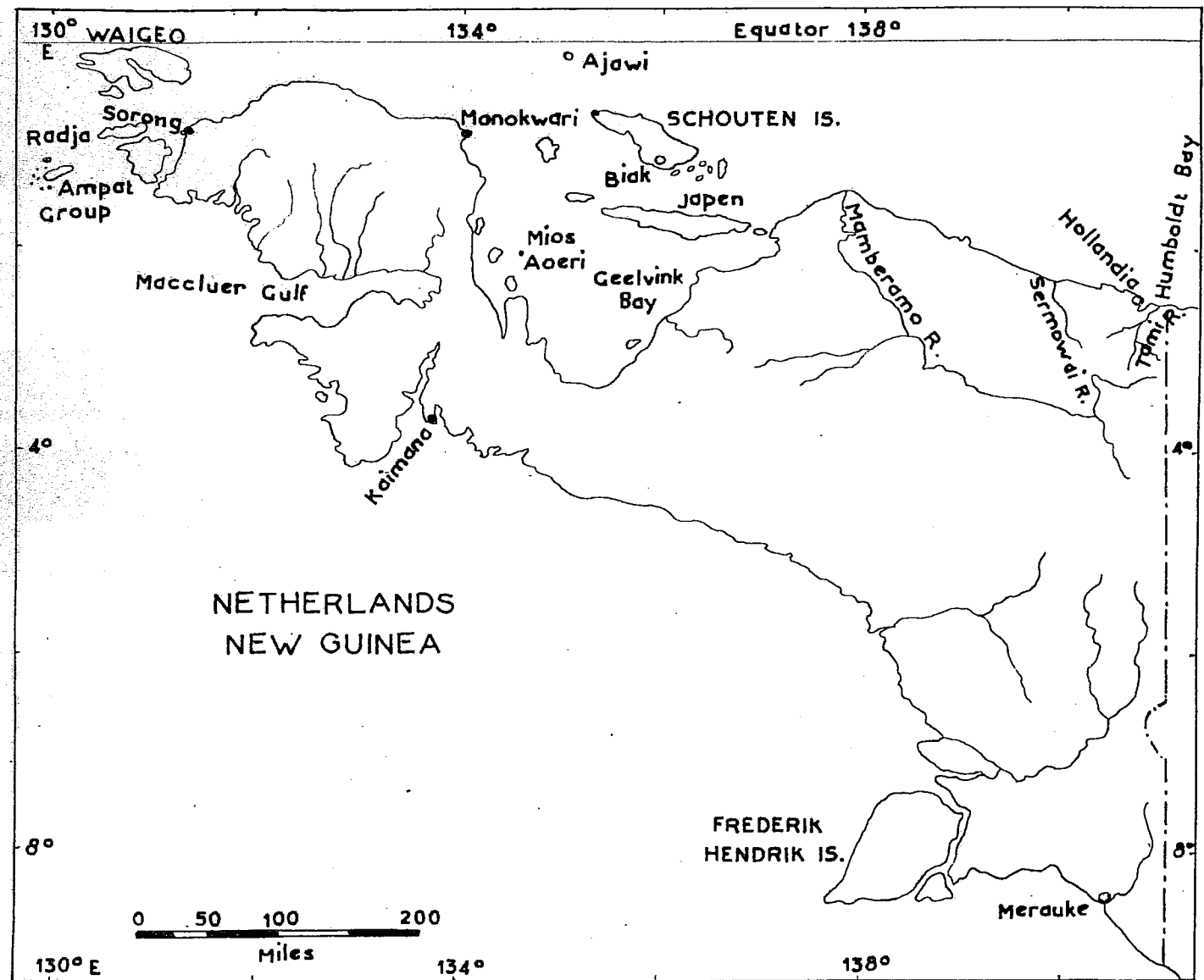
- (a) what work must be continued,
- (b) what has to stop,
- (c) what experimental boats must be built for the population,
- (d) how the fish can be preserved and marketed for inland consumption or export.

Explanation of the recommendations:

As I understand from the Governor of Netherlands New Guinea, it is His Excellency's intention to ask me to come again early in 1955 to carry out a final investigation. Although this request has not yet been submitted to the Secretary-General of the South Pacific Commission, I have taken it into consideration in drafting the above recommendations.

I fully realise that not all these recommendations will be carried out by the beginning of 1955. For instance, all the nets will not be ready and the same applies to the boats designed for the population, but such things can be taken into account.

I have kept these recommendations within the bounds of possibility. One might recommend more fishing gear, etc., but it is necessary to have the personnel for such experiments and this is already a scarcity point. The Master of "De Goede Hoop" must have a successor and a young fisheries technician must be found for Hollandia Harbour. Fortunately, however, it will be possible to find them.



EXPLANATION OF THE DRAWINGS IN THE APPENDICESAppendix 1.

10 metres wooden, motor fishing boat of three metres beam with deck and isolated fish hold. Small foc'sle in front with raised deck. Diesel engine of about 20 B.H.P. Auxiliary sail. Mast with two sprits. These latter are to be used for the trolling lines.

Appendix 2.

8 metres wooden sail fishing boat, 2.5 metres beam with an auxiliary 4.5 B.H.P. engine and outboard propeller shaft. Flat bottom build, equipped with a fishwell. Many boats in Holland have outboard propeller shafts and sail in rivers and in Ysel Lake. This propeller shaft can be ordered from H.J. Ridderinkhof, in Hasselt (Netherlands). Excellent for shallow waters and easy to beach and to handle for simple men.

Appendix 3.

120 metres beach-seine made of cotton. The meshes are horizontal between cork and lead-line. "A" is 1,333 meshes long and 265 meshes deep, if hand made. If it is machine made, it should be ordered 265 meshes long and 1,333 meshes deep.

Appendix 4.

18 metres nylon bottom gill net. The floating capacity of the corks is such that they can lift the net but not the lead-line. The nylon net does not require tanning but must be white. The rise yarns "C" are shorter than the net so that it is hanging loose between cork and lead-rope. Holes of corks and leads must not be much wider than the ropes.

Appendix 5.

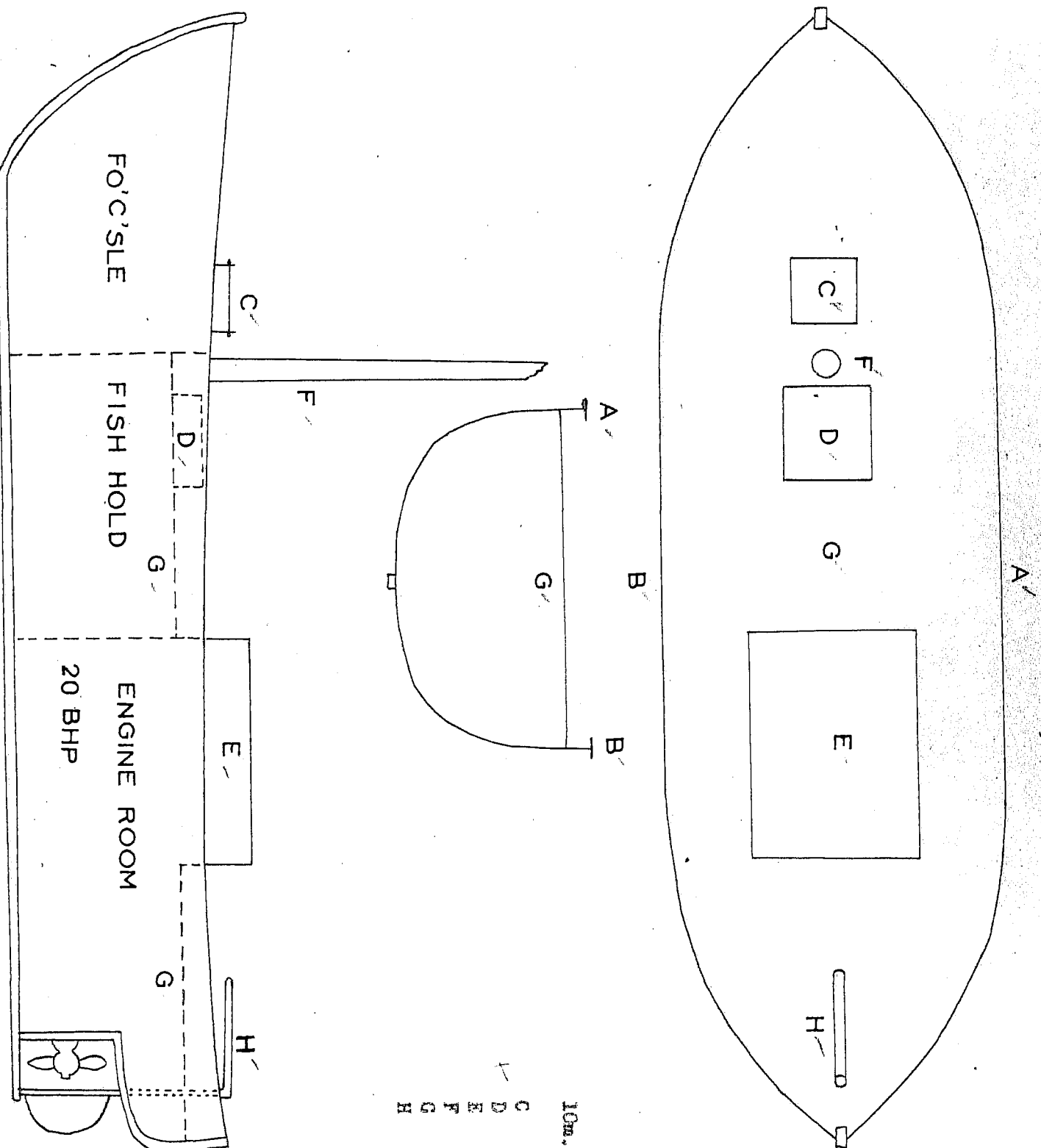
Needs no explanation.

Appendix 6.

Fishlure for attracting fish. The leaves in the rope are one-sixth of a coconut leaf. If the bottom of the sea is too hard or rocky, a stone is used instead of a bamboo anchor. The drawing indicates a bamboo float but other types of floats can also be used. The fish is always upstream of the lure except for black pomfrets (Stromateus Niger Bloch) which can be found on all sides.

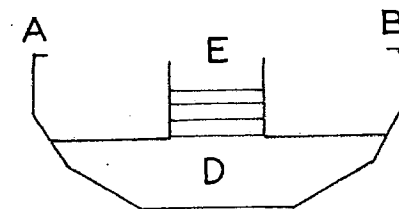
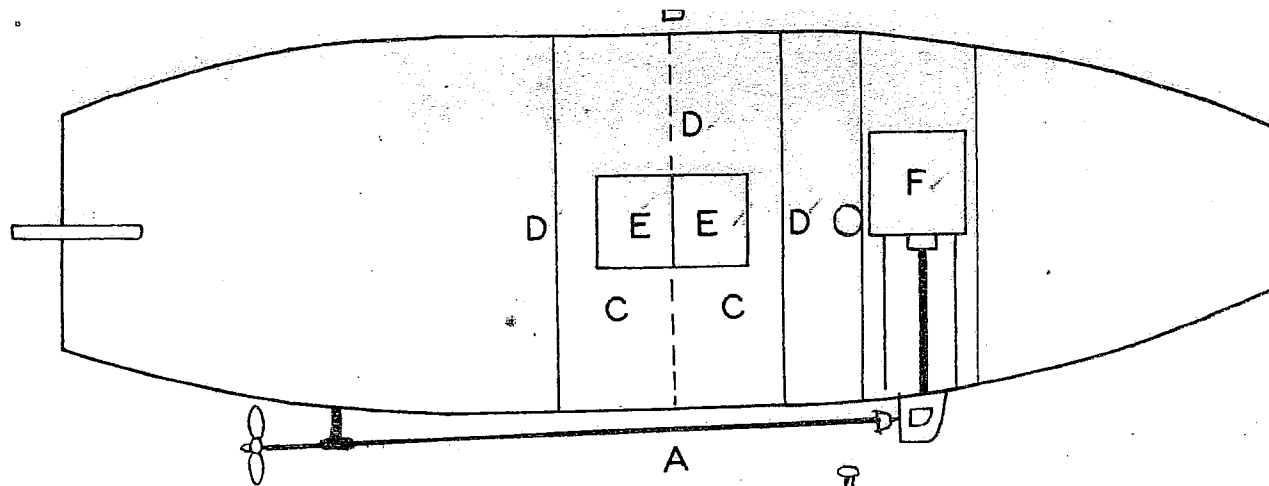
Appendix 7.

The otter boards of "De Goede Hoop" are a little too heavy for soft bottoms and have no eyebolts on three-quarters of their length. I have advised making ^lotter boards according to the design in the appendix, which will give a better spread of the net.



- 10m. Motor Fishing Boat
- C Fo'c'sle Hatch
 - D Fishhold Hatch
 - E Roof Engine Room
 - F Mast (for sails)
 - G Deck
 - H Helm

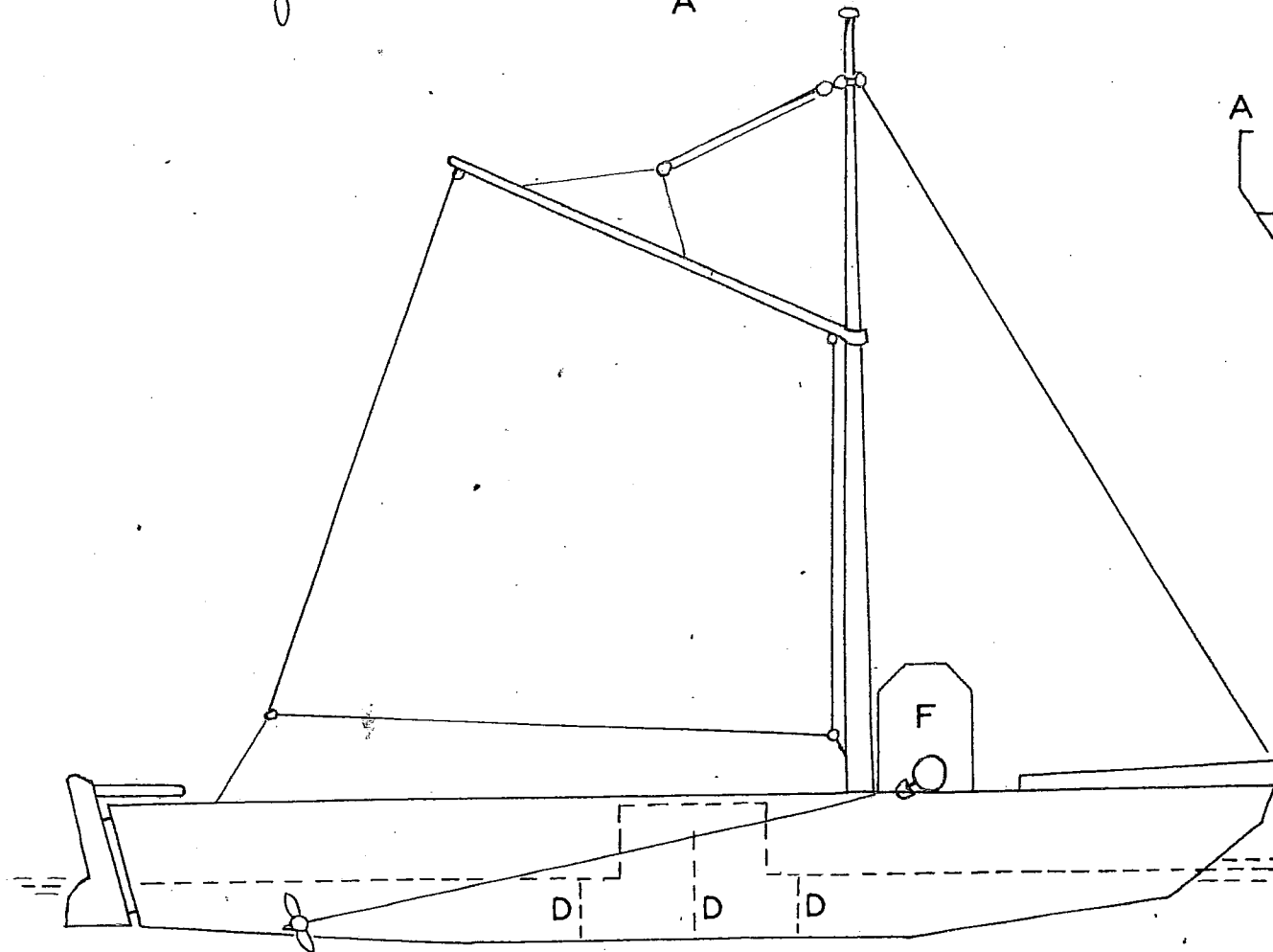
Scale -1/50

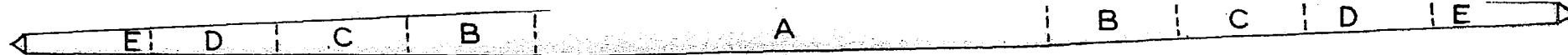


SAIL FISHING BOAT WITH AUXILIARY
ENGINE AND OUTBOARD PROPELLER SHAFT.

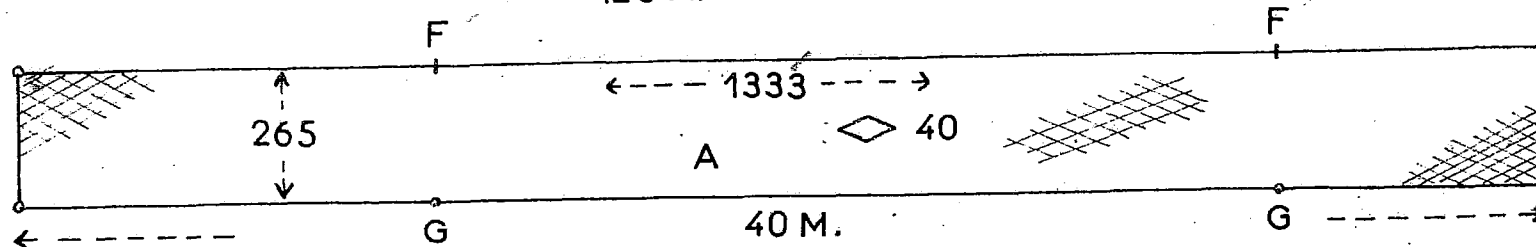
- C Fish Well
- D Bulkhead
- E Entrance C
- F Motor

Scale - 1/50

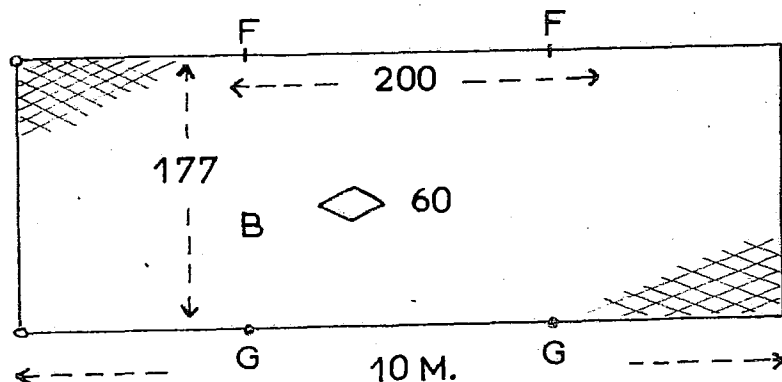




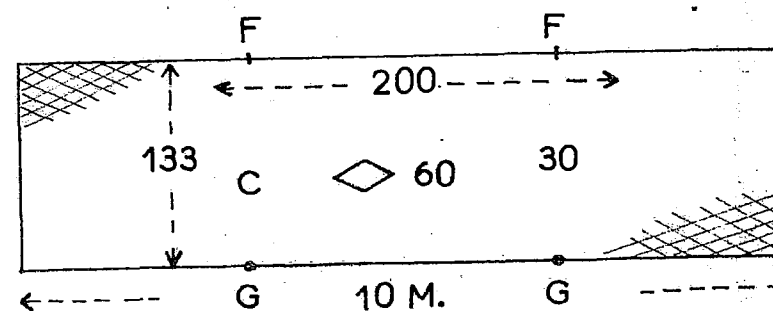
120 M. BEACH SEINE SCALE 1.500



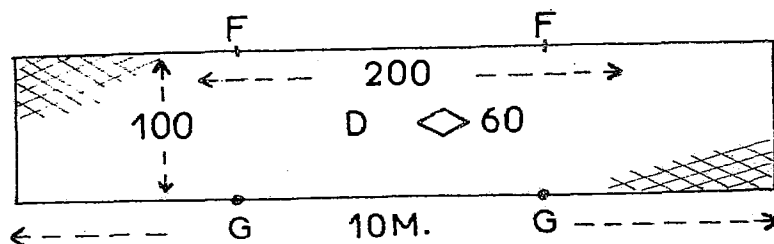
SCALE 1.200



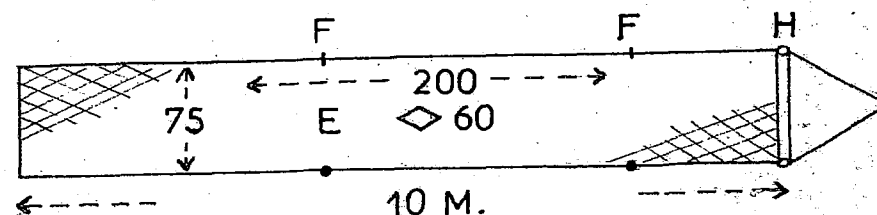
SCALE 1.100



SCALE 1.100



SCALE 1.100



SCALE 1.100

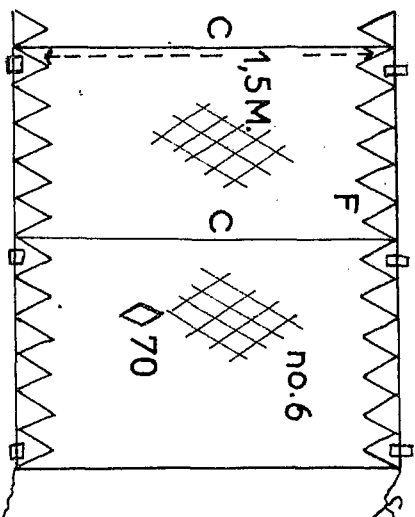
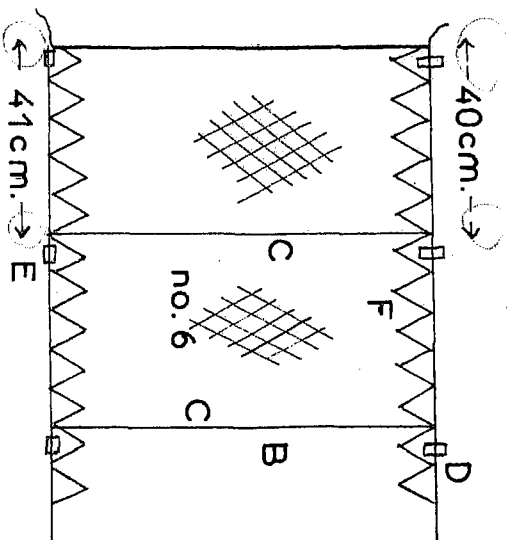
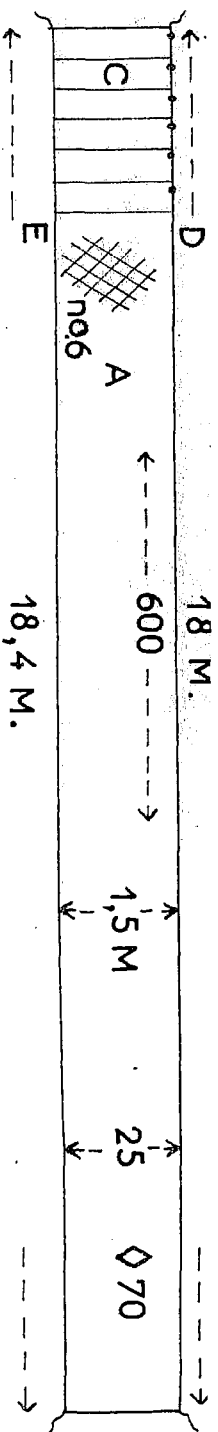
F Cork on Corkline.
G Lead on Leadline
H Darline

◇ 60 Stretched Mesh of 60 m/m.
3/8" Corkline
1/2" Leadline

B,C,D,E Every 50 c/m. A 2.1/2" Cork and 1.1/2" Lead.
A Every 30 c.m. A Cork and Lead.

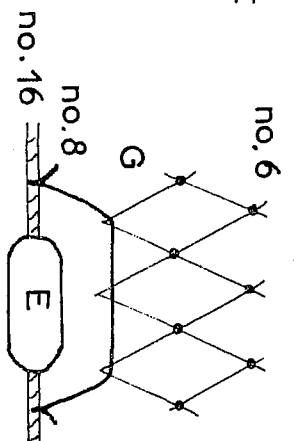
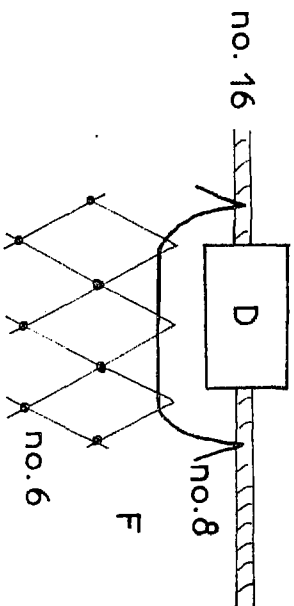
Net made of 30/12 Cotton.

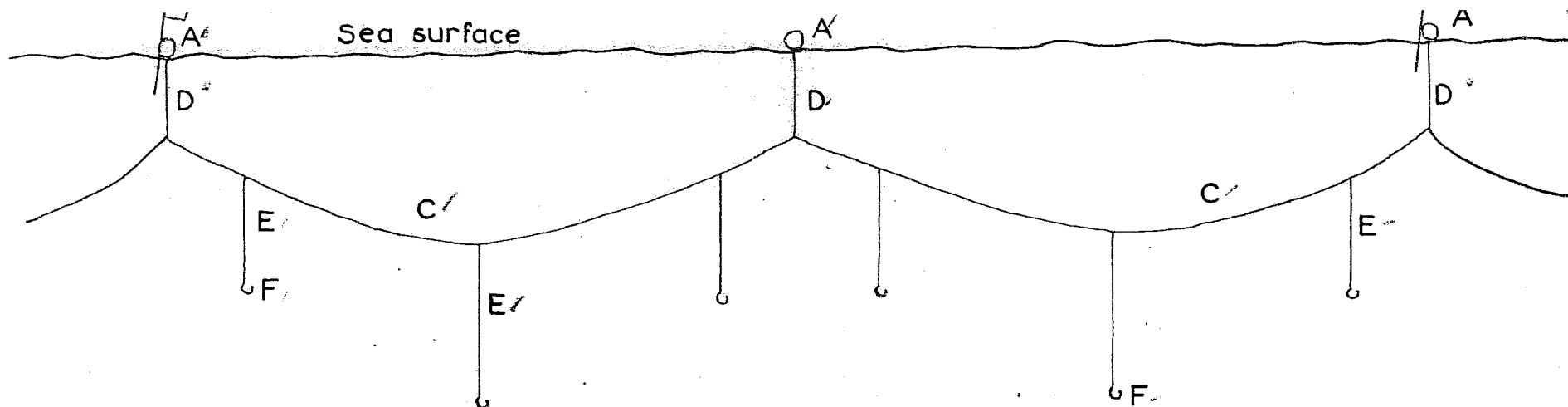
APPENDIX 3



MESHES MADE OF NYLON
NO. 6 DENIER NO. 250 x 2 x 3

- A. Bottom Gillnet 18m. (Nylon)
- B. Same as A.
- C. Nylon Yarn, No. 6
- D. Nylon
- E. Lead
- F. Nylon Net with Cones
- G. Nylon Net with Leadrope
- H. Nylon Net with Leadrope
- I. Nylon



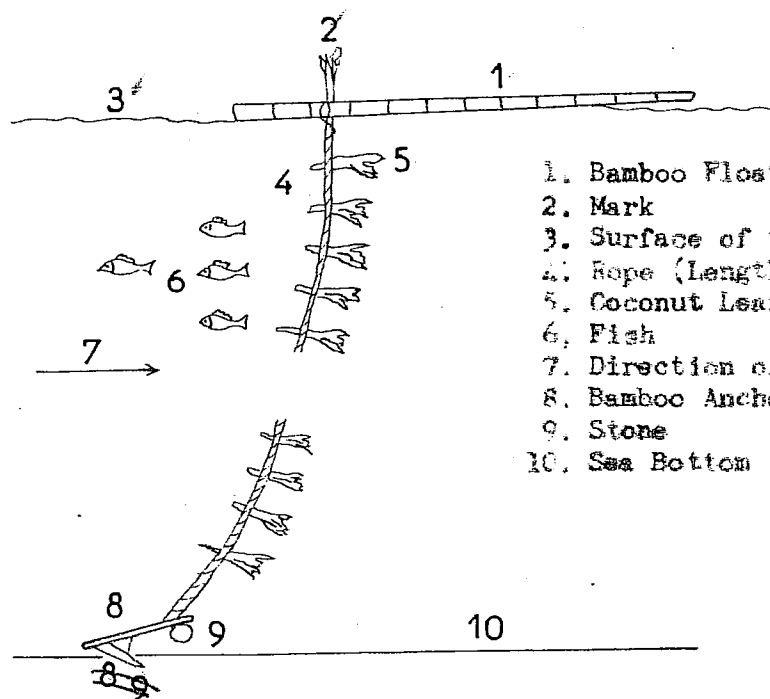


A - Steel floater; B - Buoy flag; C - main longline; D - Depth line; E - Branch line or hookline; F - Hook with bait.
 Length per set - 360 metres; Depth lines - 20 metres; Branch lines - 30 and 40 metres.

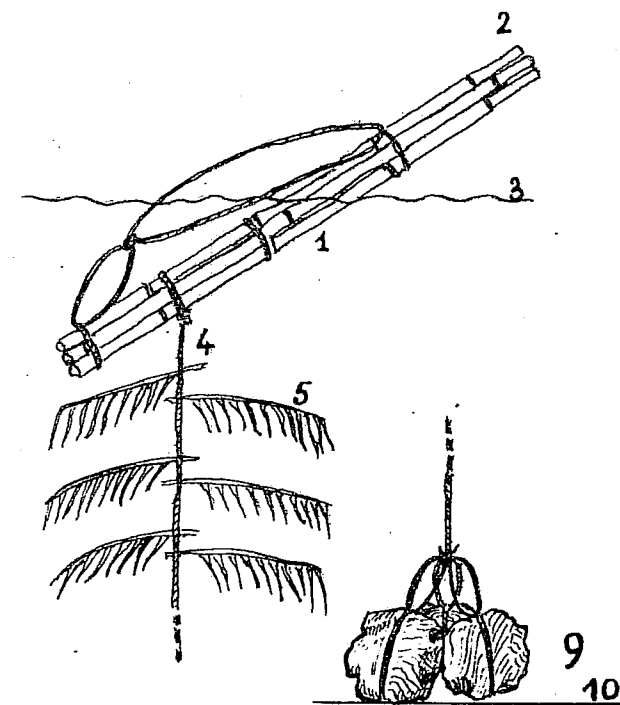
N.B. Changing of hook depth can be obtained by changing the length of depth lines or branch lines.
 The number of sets used on the tunny research vessel "Hollandia" is 55, so that the total length of the longline is 19800 metres.

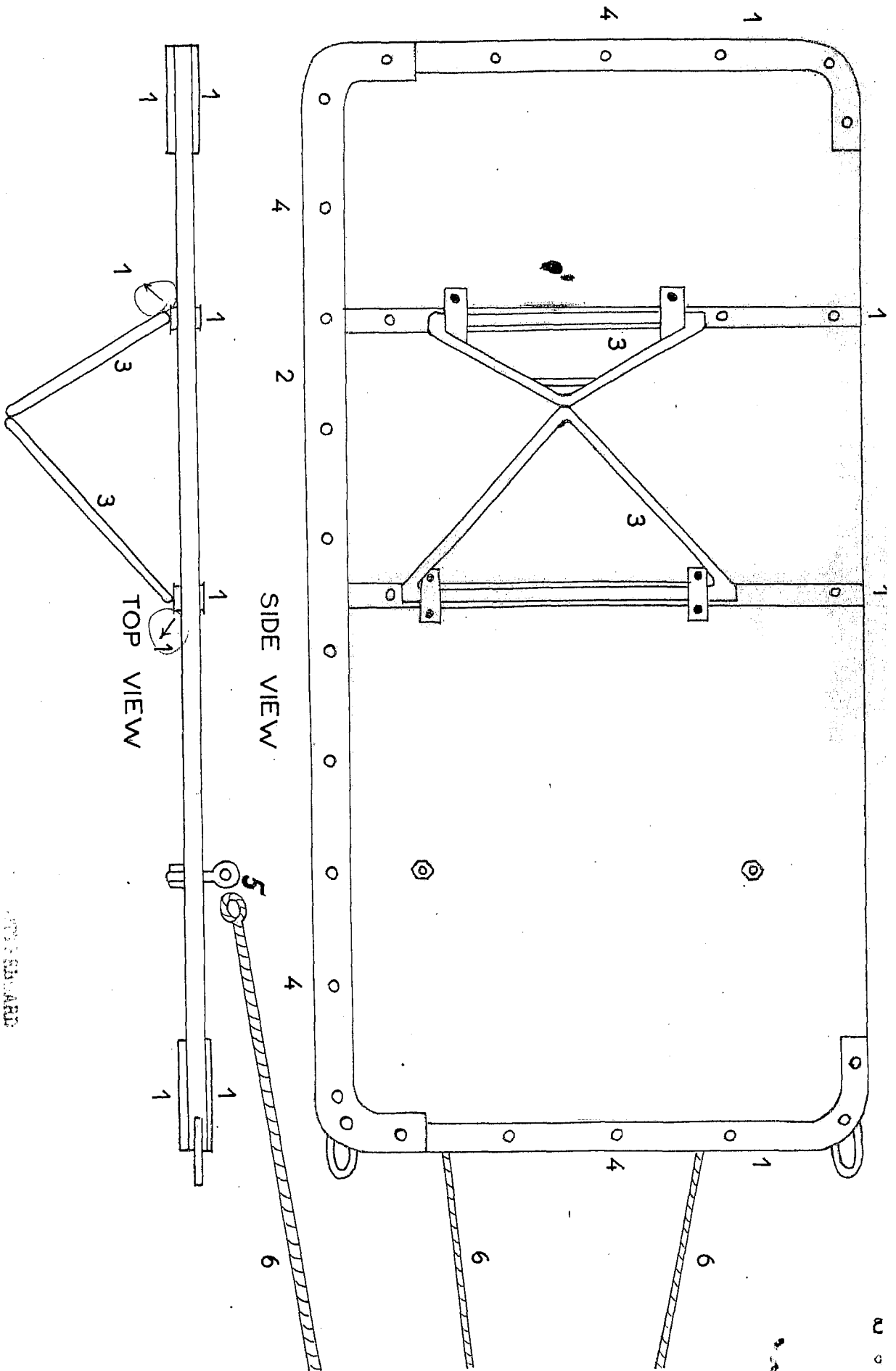
APPENDIX 5-B.

FISH LURE



1. Bamboo Floater
2. Mark
3. Surface of the Sea
4. Rope (Length 50% more than the sea depth)
5. Coconut Leaf
6. Fish
7. Direction of Current
8. Bamboo Anchor
9. Stone
10. Sea Bottom





1. Steel Iron 6 w/g
2. Steel Iron 12 w/g
3. Bar Iron 25 w/g
4. Rivet
5. Eye Bolt & Steel Wire Strop

Scale - 1/10